

1-69. (Cancelled)

70. (New) A spectral processing method for compensating a plurality of sequential spectra and profiles derived therefrom for effects of drift of data along an independent variable axis, comprising:

transforming a plurality of sequential spectra obtained from a spectrometer to provide an array of row vectors compensated for effects of drift of data along an independent variable axis, wherein the array of row vectors compensated for effects of drift of data along the independent variable axis constitutes a drift-compensated array;

performing a principal-factor determination on the drift-compensated array to provide a set of principal factors compensated for effects of drift of data along the independent variable axis; and

generating, from a profile trajectory of the row vectors compensated for effects of drift of data along the independent variable axis lying within a space of principal factors compensated for effects of drift of data along the independent variable axis, scaled target-factor profiles compensated for effects of drift of data along the independent variable axis.

71. (New) The spectral processing method of claim 70, wherein the independent variable axis comprises an abscissa of the electron spectrum.

72. (New) The spectral processing method of claim 71, wherein the drift comprises drift of data along the independent variable axis in a positive or negative direction.

73. (New) The spectral processing method of claim 70, wherein the independent variable axis comprises a axis representing temporal displacement of the data.

74. (New) The spectral processing method of claim 70 further comprising outputting the transformed array of row vectors compensated for drift of data along the independent variable axis as a sequential series of moduli wherein phase factors due to drift are nullified.

1 75. (New) The spectral processing method of claim 70 further comprising
2 generating drift-compensated compositional profiles from the drift-compensated scaled
3 target-factor profiles.

1 76. (New) The spectral processing method of claim 70, wherein the transforming
2 the plurality of sequential spectra further comprises:
3 inputting a plurality of sequential spectra from a spectrometer into a computer
4 system;
5 ordering the spectra in a primal array of row vectors, wherein each sequential
6 spectrum constitutes a successive row vector of the primal array; and
7 removing phase factors due to drift using a dephasing procedure that transforms the
8 primal array into a drift-compensated array.

1 77. (New) The spectral processing method of claim 76, wherein the dephasing
2 procedure for transforming the primal array into the drift-compensated array further
3 comprises applying a Fourier transform to the spectra in the primal array of row vectors
4 forming an array of Fourier-transformed row vectors, multiplying each Fourier-transformed
5 row vector by a complex conjugate of each Fourier-transformed row vector to form a squared
6 moduli vector thereby removing phase factors due to drift, taking the square root of each
7 element of the squared moduli vector to create a corresponding moduli vector, and forming a
8 drift-compensated array of moduli vectors by successively sequencing the moduli vectors as
9 successive drift-compensated row vectors in a drift-compensated array, wherein the moduli
10 vectors constitute moduli of Fourier-transformed spectra.

1 78. (New) The spectral processing method of claim 76, wherein the dephasing
2 procedure for transforming the primal array into the drift-compensated array further
3 comprises applying a fitting procedure to each spectrum in the primal array using selected
4 reference spectra, calculating through the fitting procedure a corresponding reference
5 weighting factor for each reference spectrum corresponding to each spectrum in the primal
6 array, removing the phase factor due to drift from each spectrum in the primal array by
7 synthesizing a corresponding drift-compensated spectrum given by the sum of each selected
8 reference spectrum multiplied by the corresponding reference weighting factor, and forming
9 a drift-compensated array by successively sequencing the drift-compensated spectra as
10 successive drift-compensated row vectors in the drift-compensated array.

1 79. (New) The spectral processing method of claim 78 further comprising
2 outputting analytical results selected from the group consisting of the selected reference
3 spectra used in the fitting procedure, the drift-compensated row vectors of the drift-
4 compensated array as a sequential series of drift-compensated spectra, reference weighting
5 factors for each reference spectrum corresponding to each spectrum in the primal array as a
6 set of drift-compensated reference-spectrum profiles, and phase factors due to drift for each
7 reference spectrum corresponding to each spectrum in the primal array as a set of phase-
8 factor profiles.

1 80. (New) The spectral processing method of claim 70, wherein the performing
2 the principal-factor determination comprises performing a factor analysis.

1 81. (New) The spectral processing method of claim 80, wherein the performing
2 the factor analysis further comprises:

3 forming a covariance array from the drift-compensated array;
4 applying an eigenanalysis to the covariance array to define a complete set of
5 eigenvectors and eigenvalues; and
6 defining a set of drift-compensated principal factors by selecting a subset of
7 eigenvectors from the complete set of eigenvectors.

1 82. (New) The spectral processing method of claim 81, wherein the defining the
2 set of drift-compensated principal factors further comprises selecting the drift-compensated
3 principal factors as a first few eigenvectors corresponding to eigenvalues above a certain
4 limiting value.

1 83. (New) The spectral processing method of claim 70, wherein the performing
2 the principal-factor determination comprises performing a linear-least-squares analysis.

1 84. (New) The spectral processing method of claim 83, wherein the performing a
2 linear-least-squares analysis further comprises:

3 selecting a set of initial factors from the set of drift-compensated row vectors of the
4 drift-compensated array;

5 performing a linear-least-squares decomposition with the set of initial factors on the
6 drift-compensated row vectors in the drift-compensated array to provide a set of residue
7 factors; and

8 performing a Gram-Schmidt orthonormalization on the combined set of initial factors
9 and residue factors to provide drift-compensated principal factors.

1 85. (New) The spectral processing method of claim 70, wherein the generating
2 drift-compensated scaled target-factor profiles further comprises:

3 constructing a set of drift-compensated target factors on a space of the drift-
4 compensated principal factors;

5 applying the set of drift-compensated target factors to a profile trajectory lying within
6 a space of drift-compensated principal factors to obtain a sequential set of target-factor
7 weighting factors corresponding to the drift-compensated target factors for the profile
8 trajectory; and

9 outputting analytical results selected from the group consisting of a set of drift-
10 compensated scaled target-factor profiles derived from the set of target-factor weighting
11 factors, and the set of drift-compensated target factors.

1 86. (New) The spectral processing method of claim 85, wherein the constructing
2 the set of drift-compensated target factors further comprises:

3 generating a profile trajectory on a 3-dimensional projection of a 4-dimensional space
4 of a set of first-four, drift-compensated principal factors along with a reference tetrahedron
5 the vertices of which represent each of the first-four, drift-compensated principal factors;

6 enclosing the profile trajectory within an enclosing tetrahedron with vertices centered
7 on end-points and in proximity to turning points of the profile trajectory, and with faces lying
8 essentially tangent to portions of the profile trajectory; and

9 calculating the drift-compensated target factors from the normed coordinates of the
10 vertices of the enclosing tetrahedron in terms of the drift-compensated principal factors.

1 87. (New) The spectral processing method of claim 86, wherein the generating
2 the profile trajectory further comprises:

3 calculating 4-space coordinates of a profile trajectory of drift-compensated target-
4 factor profiles on a 4-dimensional space to produce four coordinates for each point in the
5 profile trajectory, one coordinate for each of the first-four, drift-compensated principal
6 factors;

7 reducing the dimensionality of the coordinates of the profile trajectory by dividing
8 each coordinate by a sum of all four 4-space coordinates to produce normed coordinates for
9 the profile trajectory; and,

10 plotting the normed coordinates for the profile trajectory in a 3-dimensional space the
11 coordinate axes of which are edges of a reference tetrahedron, the vertices of which
12 correspond to unit values for each of the first-four, drift-compensated principal factors in a
13 manner analogous to plotting of coordinates on a quaternary phase diagram.

1 88. (New) The spectral processing method of claim 85, wherein generating drift-
2 compensated compositional profiles comprises:

3 defining a set of drift-compensated scaled target-factor profile values as the set of
4 scaled target-factor weighting factors;

5 dividing each drift-compensated scaled target-factor profile value by a profile
6 sensitivity factor for each constituent corresponding to the target factor to provide a
7 sensitivity-scaled target-factor profile value;

8 normalizing the sensitivity-scaled target-factor profile value by dividing each
9 sensitivity-scaled target-factor profile value for a given cycle number by the sum of all the
10 sensitivity-scaled target-factor profile values for the given cycle number to provide drift-
11 compensated compositional profile values at the given cycle number; and

12 outputting the drift-compensated compositional profile values as a set of drift-
13 compensated compositional profiles.

1 89. (New) A waveform processing method for compensating a plurality of
2 sequential waveforms and profiles derived therefrom for effects of drift comprising:

3 transforming a plurality of sequential waveforms obtained from a waveform-source
4 device to provide an array of row vectors compensated for effects of drift of data along an
5 independent variable axis, wherein the array of row vectors compensated for effects of drift
6 of data along an independent variable axis constitutes a drift-compensated array;

7 performing a principal-factor determination on the drift-compensated array to provide
8 a set of principal factors compensated for effects of drift of data along an independent
9 variable axis; and

10 generating, from a profile trajectory of the row vectors lying compensated for effects
11 of drift of data along the independent variable axis within a space of principal factors
12 compensated for effects of drift of data along the independent variable axis, scaled target-
13 factor profiles compensated for effects of drift of data along the independent variable axis.

1 90. (New) The waveform processing method of claim 89, wherein the
2 independent variable axis comprises a time-axis of a waveform.

1 91. (New) The waveform processing method of claim 90, wherein the drift
2 comprises a phase lag or lead of data representing a waveform.

1 92. (New) The waveform processing method of claim 89 further comprising
2 outputting the drift-compensated row vectors of the drift-compensated array as a sequential
3 series of moduli of Fourier-transformed waveforms.

1 93. (New) The waveform processing method of claim 89, wherein the
2 transforming the plurality of sequential waveforms further comprises:
3 inputting a plurality of sequential waveforms from a waveform-source device into a
4 computer system;
5 ordering the waveforms in a primal array of row vectors, wherein each sequential
6 waveform constitutes a successive row vector of the primal array; and
7 removing phase factors due to drift using a dephasing procedure that transforms the
8 primal array into a drift-compensated array.

1 94. (New) The waveform processing method of claim 93 wherein the dephasing
2 procedure for transforming the primal array into the drift-compensated array further
3 comprises applying a Fourier transform to the waveforms in the primal array of row vectors
4 forming an array of Fourier-transformed row vectors, multiplying each Fourier-transformed
5 row vector by a complex conjugate of each Fourier-transformed row vector to form a squared
6 moduli vector thereby removing phase factors due to drift, taking the square root of each
7 element of the squared moduli vector to create a corresponding moduli vector, and forming a
8 drift-compensated array of moduli vectors by successively sequencing the moduli vectors as
9 successive drift-compensated row vectors in a drift-compensated array, wherein the moduli
10 vectors constitute moduli of Fourier-transformed waveforms.

1 95. (New) The waveform processing method of claim 93, wherein the dephasing
2 procedure for transforming the primal array into the drift-compensated array further
3 comprises applying a fitting procedure to each sequential waveform in the primal array using
4 selected reference waveforms, calculating through the fitting procedure a corresponding
5 reference weighting factor for each reference waveform corresponding to each waveform in
6 the primal array, removing the phase factor due to drift from each waveform in the primal
7 array by synthesizing a corresponding drift-compensated waveform given by the sum of each
8 selected reference waveform multiplied by the corresponding reference weighting factor, and
9 forming a drift-compensated array by successively sequencing the drift-compensated
10 waveforms as successive drift-compensated row vectors in the drift-compensated array.

1 96. (New) The waveform processing method of claim 95 further comprising
2 outputting analytical results selected from the group consisting of the selected reference
3 waveforms used in the fitting procedure, the drift-compensated row vectors of the drift-
4 compensated array as a sequential series of drift-compensated waveforms, reference
5 weighting factors for each reference waveform corresponding to each waveform in the primal
6 array as a set of drift-compensated reference-waveform profiles, and phase factors due to
7 drift for each reference waveform corresponding to each waveform in the primal array as a
8 set of phase-factor profiles.

1 97. (New) The waveform processing method of claim 89, wherein the performing
2 the principal-factor determination comprises performing a factor analysis.

1 98. (New) The waveform processing method of claim 97, wherein the performing
2 the factor analysis further comprises:
3 forming a covariance array from the drift-compensated array;
4 applying an eigenanalysis to the covariance array to define a complete set of
5 eigenvectors and eigenvalues; and
6 defining a set of drift-compensated principal factors by selecting a subset of
7 eigenvectors from the complete set of eigenvectors.

1 99. (New) The waveform processing method of claim 98, wherein the defining
2 the set of drift-compensated principal factors further comprises selecting the drift-
3 compensated principal factors as a first few eigenvectors corresponding to eigenvalues above
4 a certain limiting value.

1 100. (New) The waveform processing method of claim 89, wherein the performing
2 the principal-factor determination comprises performing a linear-least-squares analysis.

1 101. (New) The waveform processing method of claim 100, wherein the
2 performing a linear-least-squares analysis further comprises:
3 selecting a set of initial factors from the set of drift-compensated row vectors of the
4 drift-compensated array;
5 performing a linear-least-squares decomposition with the set of initial factors on the
6 drift-compensated row vectors in the drift-compensated array to provide a set of residue
7 factors; and
8 performing a Gram-Schmidt orthonormalization on the combined set of initial factors
9 and residue factors to provide drift-compensated principal factors.

1 102. (New) The waveform processing method of claim 89, wherein the generating
2 drift-compensated scaled target-factor profiles further comprises:
3 constructing a set of drift-compensated target factors on a space of the drift-
4 compensated principal factors;
5 applying the set of drift-compensated target factors to a profile trajectory lying within
6 a space of drift-compensated principal factors to obtain a sequential set of target-factor
7 weighting factors corresponding to the drift-compensated target factors for the profile
8 trajectory; and
9 outputting analytical results selected from the group consisting of a set of drift-
10 compensated scaled target-factor profiles derived from the set of target-factor weighting
11 factors, and the set of drift-compensated target factors.

1 103. (New) The waveform processing method of claim 102, wherein the
2 constructing the set of drift-compensated target factors further comprises:
3 generating a profile trajectory on a 3-dimensional projection of a 4-dimensional space
4 of a set of first-four, drift-compensated principal factors along with a reference tetrahedron
5 the vertices of which represent each of the first-four, drift-compensated principal factors;
6 enclosing the profile trajectory within an enclosing tetrahedron with vertices centered
7 on end-points and in proximity to turning points of the profile trajectory, and with faces lying
8 essentially tangent to portions of the profile trajectory; and
9 calculating the drift-compensated target factors from the normed coordinates of the
10 vertices of the enclosing tetrahedron in terms of the drift-compensated principal factors.

1 104. (New) The waveform processing method of claim 103, wherein the
2 generating the profile trajectory further comprises:
3 calculating 4-space coordinates of a profile trajectory of drift-compensated target-
4 factor profiles on a 4-dimensional space to produce four coordinates for each point in the
5 profile trajectory, one coordinate for each of the first-four, drift-compensated principal
6 factors;
7 reducing the dimensionality of the coordinates of the profile trajectory by dividing
8 each coordinate by a sum of all four 4-space coordinates to produce normed coordinates for
9 the profile trajectory; and,
10 plotting the normed coordinates for the profile trajectory in a 3-dimensional space the
11 coordinate axes of which are edges of a reference tetrahedron, the vertices of which
12 correspond to unit values for each of the first-four, drift-compensated principal factors in a
13 manner analogous to plotting of coordinates on a quaternary phase diagram.

1 105. (New) An apparatus for compensating a plurality of sequential spectra and
2 profiles derived therefrom for effects of drift comprising a spectroscopic analysis system,
3 wherein the spectroscopic analysis system comprises:

4 a spectrometer; and

5 a computer system, coupled to the spectrometer, for analyzing spectra input from the
6 spectrometer, the computer system further comprising a spectral processor for compensating
7 a plurality of sequential spectra and profiles derived therefrom for effects of drift of data
8 along an independent variable axis.

1 106. (New) The apparatus of claim 105, wherein the spectrometer comprises an
2 electron spectrometer.

1 107. (New) The apparatus of claim 106, wherein the electron spectrometer
2 comprises an Auger spectrometer.

1 108. (New) The apparatus of claim 106, wherein the electron spectrometer
2 comprises an x-ray photoelectron spectrometer.

1 109. (New) The apparatus of claim 106, wherein the electron spectrometer
2 comprises an electron energy loss spectrometer.

1 110. (New) The apparatus of claim 105, wherein the spectral processor further
2 comprises:

3 a spectral transformer operating on a plurality of sequential spectra obtained from the
4 spectrometer to provide an array of row vectors compensated for effects of drift of data along
5 the independent variable axis, wherein the array of row vectors compensated for effects of
6 drift of data along an independent variable axis constitutes a drift-compensated array;

7 a principal-factor determinator operating on the drift-compensated array to provide a
8 set of principal factors compensated for effects of drift of data along the independent variable
9 axis; and

10 a profile generator operating on a profile trajectory of the row vectors compensated
11 for effects of drift of data along the independent variable axis lying within a space of
12 principal factors compensated for effects of drift of data along the independent variable axis
13 to provide a set of scaled target-factor profiles compensated for effects of drift of data along
14 the independent variable axis.

1 111. (New) The apparatus of claim 110, wherein the independent variable axis
2 comprises an abscissa of the electron spectrum.

1 112. (New) The apparatus of claim 111, wherein the drift comprises drift of data
2 along the independent variable axis in a positive or negative direction.

1 113. (New) The apparatus of claim 110, wherein the spectral transformer outputs
2 to an output device the drift-compensated row vectors of the drift-compensated array as a
3 sequential series of moduli of Fourier-transformed spectra.

1 114. (New) The apparatus of claim 110, wherein the profile generator operating on
2 the set drift-compensated scaled target-factor profiles generates a set of drift-compensated
3 compositional profiles.

1 115. (New) The apparatus of claim 110, wherein the spectral transformer accepts
2 as input the plurality of sequential spectra obtained from the spectrometer into the computer
3 system, orders the spectra in a primal array, wherein each sequential spectrum constitutes a
4 successive row vector of the primal array, and removes phase factors due to drift using a
5 dephaser that transforms the primal array into a drift-compensated array.

1 116. (New) The apparatus of claim 115, wherein the dephaser that transforms the
2 primal array into the drift-compensated array applies a Fourier transform to the spectra in the
3 primal array of row vectors to form an array of Fourier-transformed row vectors, multiplies
4 each Fourier-transformed row vector by a complex conjugate of each Fourier-transformed
5 row vector to form a squared moduli vector thereby removing phase factors due to drift, takes
6 the square root of each element of the squared moduli vector to create a corresponding
7 moduli vector, and forms a drift-compensated array of moduli vectors by successively
8 sequencing the moduli vectors as successive drift-compensated row vectors in a drift-
9 compensated array, wherein the moduli vectors constitute moduli of Fourier-transformed
10 spectra.

1 117. (New) The apparatus of claim 116, wherein the dephaser that transforms the
2 primal array into the drift-compensated array fits each spectrum in the primal array using
3 selected reference spectra, calculates a corresponding reference weighting factor for each
4 reference spectrum corresponding to each spectrum in the primal array, synthesizes a
5 corresponding drift-compensated spectrum given by the sum of each selected reference
6 spectrum multiplied by the corresponding reference weighting factor thereby removing phase
7 factors due to drift, and forms a drift-compensated array by successively sequencing the drift-
8 compensated spectra as successive drift-compensated row vectors in the drift-compensated
9 array.

1 118. (New) The apparatus of claim 117, wherein the spectral transformer outputs
2 to an output device analytical results selected from the group consisting of the selected
3 reference spectra used in the fitting procedure, the drift-compensated row vectors of the drift-
4 compensated array as a sequential series of drift-compensated spectra, reference weighting
5 factors for each reference spectrum corresponding to each spectrum in the primal array as a
6 set of drift-compensated reference-spectrum profiles, and phase factors due to drift for each
7 reference spectrum corresponding to each spectrum in the primal array as a set of phase-
8 factor profiles.

1 119. (New) The apparatus of claim 110, wherein the principal-factor determinator
2 comprises a factor analyzer.

1 120. (New) The apparatus of claim 119, wherein the factor analyzer forms a
2 covariance array from the drift-compensated array, applies an eigenanalysis to the covariance
3 array to define a complete set of eigenvectors and eigenvalues, and defines a set of drift-
4 compensated principal factors as a subset of eigenvectors determined by a selector operating
5 on the complete set of eigenvectors.

1 121. (New) The apparatus of claim 120, wherein the selector operates on the
2 complete set of eigenvectors to define the set of drift-compensated principal factors as a first
3 few eigenvectors corresponding to eigenvalues above a certain limiting value.

1 122. (New) The apparatus of claim 110, wherein the principal-factor determinator
2 comprises a linear-least-squares analyzer.

1 123. (New) The apparatus of claim 122, wherein the linear-least-squares analyzer
2 selects a set of initial factors from the set of drift-compensated row vectors of the drift-
3 compensated array, performs a linear-least-squares decomposition with the set of initial
4 factors on the drift-compensated row vectors in the drift-compensated array to provide a set
5 of residue factors, and performs a Gram-Schmidt orthonormalization on the combined set of
6 initial factors and residue factors to provide drift-compensated principal factors.

1 124. (New) The apparatus of claim 110, wherein the profile generator defines a set
2 of drift-compensated target factors on a space of the drift-compensated principal factors
3 determined by a target-factor constructor operating on the drift-compensated principal
4 factors, applies the set of drift-compensated target factors to a profile trajectory lying within
5 a space of drift-compensated principal factors to obtain a sequential set of target-factor
6 weighting factors corresponding to the drift-compensated target factors for the profile
7 trajectory, and outputs to an output device analytical results selected from the group
8 consisting of a set of drift-compensated scaled target-factor profiles derived from the set of
9 target-factor weighting factors, and the set of drift-compensated target factors.

1 125. (New) The apparatus of claim 124, wherein the target-factor constructor
2 generates a profile trajectory on a 3-dimensional projection of a 4-dimensional space of a set
3 of first-four, drift-compensated principal factors along with a reference tetrahedron the
4 vertices of which represent each of the first-four, drift-compensated principal factors;
5 encloses the profile trajectory within an enclosing tetrahedron with vertices centered on end-
6 points and in proximity to turning points of the profile trajectory, and with faces lying
7 essentially tangent to portions of the profile trajectory; and calculates the drift-compensated
8 target factors from the normed coordinates of the vertices of the enclosing tetrahedron in
9 terms of the drift-compensated principal factors.

1 126. (New) The apparatus of claim 125, wherein the target-factor constructor in
2 generating the profile trajectory further calculates 4-space coordinates of a profile trajectory
3 of drift-compensated target-factor profiles on a 4-dimensional space to produce four
4 coordinates for each point in the profile trajectory, one coordinate for each of the first-four,
5 drift-compensated principal factors; reduces the dimensionality of the coordinates of the
6 profile trajectory by dividing each coordinate by a sum of all four 4-space coordinates to
7 produce normed coordinates for the profile trajectory; and, plots the normed coordinates for
8 the profile trajectory in a 3-dimensional space the coordinate axes of which are edges of a
9 reference tetrahedron the vertices of which correspond to unit values for each of the first-
10 four, drift-compensated principal factors in a manner analogous to plotting of coordinates on
11 a quaternary phase diagram.

1 127. (New) The apparatus of claim 124, wherein the profile generator further
2 defines a set of drift-compensated scaled target-factor profile values as the set of scaled
3 target-factor weighting factors, divides each drift-compensated scaled target-factor profile
4 value by a profile sensitivity factor for each constituent corresponding to the target factor to
5 provide a sensitivity-scaled target-factor profile value, divides each sensitivity-scaled target-
6 factor profile value for a given cycle number by the sum of all the sensitivity-scaled target-
7 factor profile values for the given cycle number to provide drift-compensated compositional
8 profile values at the given cycle number, and outputs the drift-compensated compositional
9 profile values as a set of drift-compensated compositional profiles.

1 128. (New) An apparatus for compensating a plurality of sequential waveforms
2 and profiles derived therefrom for effects of drift, comprising a waveform analysis system,
3 wherein the waveform analysis system comprises:
4 a waveform-source device; and
5 a computer system, coupled to the waveform-source device, for analyzing waveforms
6 input from the waveform-source device, the computer system further comprising a waveform
7 processor for compensating a plurality of sequential waveforms and profiles derived
8 therefrom for effects of drift of data along an independent variable axis.

1 129. (New) The apparatus of claim 128, wherein the waveform processor further
2 comprises:

3 a waveform transformer operating on a plurality of sequential waveforms obtained
4 from a waveform-source device to provide an array of row vectors compensated for effects of
5 drift of data along the independent variable axis, wherein the array of row vectors
6 compensated for effects of drift of data along the independent variable axis constitutes a
7 drift-compensated array;

8 a principal-factor determinator operating on the drift-compensated array to provide a
9 set of principal factors compensated for effects of drift of data along the independent variable
10 axis; and

11 a profile generator operating on a profile trajectory of the row vectors compensated
12 for effects of drift of data along the independent variable axis lying within a space of
13 principal factors compensated for effects of drift of data along the independent variable axis
14 to provide a set of scaled target-factor profiles compensated for effects of drift of data along
15 the independent variable axis.

1 130. (New) The apparatus of claim 129, wherein the independent variable axis
2 comprises a time-axis of a waveform.

1 131. (New) The apparatus of claim 130, wherein the drift comprises a phase lag or
2 lead of data representing a waveform.

1 132. (New) The apparatus of claim 129, wherein the waveform transformer
2 outputs the drift-compensated row vectors of the drift-compensated array as a sequential
3 series of moduli of Fourier-transformed waveforms.

1 133. (New) The apparatus of claim 129, wherein the waveform transformer
2 accepts as input the plurality of sequential waveforms obtained from a waveform-source
3 device into the computer system, orders the waveforms in a primal array, wherein each
4 sequential waveform constitutes a successive row vector of the primal array, and removes
5 phase factors due to drift using a dephaser that transforms the primal array into a drift-

6 compensated array.

1 134. (New) The apparatus of claim 133, wherein the dephaser that transforms the
2 primal array into the drift-compensated array applies a Fourier transform to the primal array
3 of row vectors to form an array of Fourier-transformed row vectors, multiplies each Fourier-
4 transformed row vector by a complex conjugate of each Fourier-transformed row vector to
5 form a squared moduli vector thereby removing phase factors due to drift, takes the square
6 root of each element of the squared moduli vector to create a corresponding moduli vector,
7 and forms a drift-compensated array of moduli vectors by successively sequencing the
8 moduli vectors as successive drift-compensated row vectors in a drift-compensated array,
9 wherein the moduli vectors constitute moduli of Fourier-transformed waveforms.

1 135. (New) The apparatus of claim 133, wherein the dephaser that transforms the
2 primal array into the drift-compensated array fits each waveform in the primal array using
3 selected reference waveforms, calculates a corresponding reference weighting factor for each
4 reference waveform corresponding to each waveform in the primal array, synthesizes a
5 corresponding drift-compensated waveform given by the sum of each selected reference
6 waveform multiplied by the corresponding reference weighting factor thereby removing
7 phase factors due to drift, and forms a drift-compensated array by successively sequencing
8 the drift-compensated waveforms as successive drift-compensated row vectors in the drift-
9 compensated array.

1 136. (New) The apparatus of claim 135, wherein the waveform transformer
2 outputs to an output device analytical results selected from the group consisting of the
3 selected reference waveforms used in the fitting procedure, the drift-compensated row
4 vectors of the drift-compensated array as a sequential series of drift-compensated waveforms,
5 reference weighting factors for each reference waveform corresponding to each waveform in
6 the primal array as a set of drift-compensated reference-waveform profiles, and phase factors
7 due to drift for each reference waveform corresponding to each waveform in the primal array
8 as a set of phase-factor profiles.

1 137. (New) The apparatus of claim 129, wherein the principal-factor determinant
2 comprises a factor analyzer.

1 138. (New) The apparatus of claim 137, wherein the factor analyzer forms a
2 covariance array from the drift-compensated array, applies an eigenanalysis to the covariance
3 array to define a complete set of eigenvectors and eigenvalues, and defines a set of drift-
4 compensated principal factors as a subset of eigenvectors determined by a selector operating
5 on the complete set of eigenvectors.

1 139. (New) The apparatus of claim 138, wherein the selector operates on the
2 complete set of eigenvectors to define the set of drift-compensated principal factors as a first
3 few eigenvectors corresponding to eigenvalues above a certain limiting value.

1 140. (New) The apparatus of claim 129, wherein the principal-factor determinant
2 comprises a linear-least-squares analyzer.

1 141. (New) The apparatus of claim 140, wherein the linear-least-squares analyzer
2 selects a set of initial factors from the set of drift-compensated row vectors of the drift-
3 compensated array, performs a linear-least-squares decomposition with the set of initial
4 factors on the drift-compensated row vectors in the drift-compensated array to provide a set
5 of residue factors, and performs a Gram-Schmidt orthonormalization on the combined set of
6 initial factors and residue factors to provide drift-compensated principal factors.

1 142. (New) The apparatus of claim 129, wherein the profile generator defines a set
2 of drift-compensated target factors on a space of the drift-compensated principal factors
3 determined by a target-factor constructor operating on the drift-compensated principal
4 factors, applies the set of drift-compensated target factors to a profile trajectory lying within
5 a space of drift-compensated principal factors to obtain a sequential set of target-factor
6 weighting factors corresponding to the drift-compensated target factors for the profile
7 trajectory, and outputs to an output device analytical results selected from the group
8 consisting of a set of drift-compensated scaled target-factor profiles derived from the set of

- 9 target-factor weighting factors, and the set of drift-compensated target factors.

1 143. (New) The apparatus of claim 142, wherein the target-factor constructor
2 generates a profile trajectory on a 3-dimensional projection of a 4-dimensional space of a set of
3 first-four, drift-compensated principal factors along with a reference tetrahedron the vertices of
4 which represent each of the first-four, drift-compensated principal factors; encloses the profile
5 trajectory within an enclosing tetrahedron with vertices centered on end-points and in proximity
6 to turning points of the profile trajectory, and with faces lying essentially tangent to portions of
7 the profile trajectory; and calculates the drift-compensated target factors from the normed
8 coordinates of the vertices of the enclosing tetrahedron in terms of the drift-compensated
9 principal factors.

1 144. (New) The apparatus of claim 143, wherein the target-factor constructor in
2 generating the profile trajectory further calculates 4-space coordinates of a profile trajectory of
3 drift-compensated target-factor profiles on a 4-dimensional space to produce four coordinates for
4 each point in the profile trajectory, one coordinate for each of the first-four, drift-compensated
5 principal factors; reduces the dimensionality of the coordinates of the profile trajectory by
6 dividing each coordinate by a sum of all four 4-space coordinates to produce normed coordinates
7 for the profile trajectory; and, plots the normed coordinates for the profile trajectory in a 3-
8 dimensional space the coordinate axes of which are edges of a reference tetrahedron the vertices
9 of which correspond to unit values for each of the first-four, drift-compensated principal factors
10 in a manner analogous to plotting of coordinates on a quaternary phase diagram.

1 145. (New) An article of manufacture comprising a program storage medium readable
2 by a computer, the medium tangibly embodying one or more programs of instructions executable
3 by the computer to perform a method for compensating a plurality of sequential spectra and
4 profiles derived therefrom for effects of drift, the method comprising:

5 transforming a plurality of sequential spectra obtained from a spectrometer to provide an
6 array of row vectors compensated for effects of drift of data along an independent variable axis,
7 wherein the array of row vectors compensated for effects of drift of data along the independent
8 variable axis constitutes a drift-compensated array;

9 performing a principal-factor determination on the drift-compensated array to provide a
10 set of principal factors compensated for effects of drift of data along the independent variable
11 axis; and,

12 generating, from a profile trajectory of the row vectors compensated for effects of drift of
13 data along the independent variable axis lying within a space of principal factors compensated
14 for effects of drift of data along the independent variable axis, scaled target-factor profiles
15 compensated for effects of drift of data along the independent variable axis.

1 146. (New) The article of manufacture of claim 145 further comprising generating
2 drift-compensated compositional profiles from the set of drift-compensated scaled target-factor
3 profiles.

1 147. (New) An article of manufacture comprising a program storage medium readable
2 by a computer, the medium tangibly embodying one or more programs of instructions executable
3 by the computer to perform a method for compensating a plurality of sequential waveforms and
4 profiles derived therefrom for effects of drift of data along the independent variable axis, the
5 method comprising:

6 transforming a plurality of sequential waveforms obtained from a waveform-source
7 device to provide an array of row vectors compensated for effects of drift of data along an
8 independent variable axis, wherein the array of row vectors compensated for effects of drift of
9 data along the independent variable axis constitutes a drift-compensated array;

10 performing a principal-factor determination on the drift-compensated array to provide a
11 set of principal factors compensated for effects of drift of data along the independent variable
12 axis; and,

13 generating, from a profile trajectory of the row vectors compensated for effects of drift of
14 data along the independent variable axis lying within a space of principal factors compensated
15 for effects of drift of data along the independent variable axis, scaled target-factor profiles
16 compensated for effects of drift of data along the independent variable axis.